# HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

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| **Hatchery Program:** | Nisqually Hatchery at Clear Creek |
| **Species or Hatchery Stock:** | Fall Chinook |
| **Agency/Operator:** | Nisqually Indian Tribe |
| **Watershed and Region:** | Nisqually River, WRIA 11, Puget Sound |
| **Date Submitted:** | June 30, 2000 |
| **Date Last Updated:** | July 26, 2000 |

## SECTION 1. GENERAL PROGRAM DESCRIPTION

**1.1) Name of hatchery or program**.
Nisqually Hatchery at Clear Creek
**1.2) Species and population (or stock) under propagation, and ESA status**.
Fall Chinook (Oncorhynchus tshawytscha), Hatchery stock (Unlisted).

**1.3) Responsible organization and individuals**

*Indicate lead contact and on-site operations staff lead.*

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**Name (and title:** David Troutt (Director of Natural Resources)
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**Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:** NA

**1.4) Funding source, staffing level, and annual hatchery program operational costs.**

Tacoma City Light is the funding source for this program. Staffing level is 5.75 FTE's.

1.5) **Location(s) of hatchery and associated facilities**.

Clear Creek (WRIA 11.0013C) is a right bank tributary located at RM 6.3 on the Nisqually River, Puget Sound, Washington. The facility is located at RM 0.2 of Clear Creek.

1.6) **Type of program.**

Isolated Harvest

1.7) **Purpose (Goal) of program.**

The purpose of this program is to provide for treaty reserved fishing opportunity for the Nisqually Tribe and recreational fishing opportunity for Puget Sound recreational anglers.

1.8) **Justification for the program.**

A habitat based analysis of the production potential for fall chinook in the Nisqually River indicates that approximately 90% of its historic capacity has been lost due to significant freshwater, estuarine, and nearshore habitat degradation. Specifically, the equilibrium run size has been reduced from a historic level of over 14,000 fish to its current level of approximately 1200 fish. In order to meet the Nisqually Tribe's goal of providing an in-river harvest of 10,000 – 15,000 fall chinook as well as opportunity for sport harvest, given the current habitat conditions in the system, a substantial artificial production program, including the program described in this plan is necessary.

In addition to habitat alterations, past artificial production and harvest management practices have had serious impacts on the viability of the natural fall chinook in the Nisqually River. Hatchery fish from at least nine different brood stocks have been released or outplanted from Nisqually River and other Puget Sound facilities since at least 1943. Between 1943 and 1974 over 12.8 million chinook were released throughout the watershed with an average annual release of over 400,000 fish. From 1975 through 1990, hatchery chinook outplanting and releases into the Nisqually River totalled over 39.3 million fish with an average yearly release of over 2.46 million fish. During this period over 71% of the releases were as outplants or from facilities where hatchery returns could not segregate from natural spawners. Fisheries during this time were generally managed for hatchery escapement needs and routinely subjected chinook stocks to harvest rates far in excess of those appropriate for natural stocks. Despite these past practices, with modifications to harvest and hatchery programs designed to improve the diversity of the natural and hatchery population, as well as an aggressive habitat protection and enhancement program to increase the productivity and abundance of the natural run, there is a potential to develop a locally adapted, self-sustaining natural chinook run in the Nisqually River.

The artificial production program described here will be operated using a series of risk reduction actions that are designed to control potential negative genetic and ecological interactions while providing for a meaningful treaty and non-treaty harvest. Specific actions will include reduction of ecological risks by maintaining spatial separation from natural stocks as well as program modifications to reduce competition and predation. Genetic risks will be controlled by utilizing stock policies and spawning protocols to reduce the risk of loss of within and between population variability. These efforts will be complimented by modification of harvest objectives and development of a stock identification and monitoring program that will allow for the assessment of natural stock status. Specific actions in these areas will be discussed in further detail in the appropriate sections of this hatchery and genetic management plan (HGMP)

**1.9) List of program "Performance Standards".**

| Goal | Performance Standards | Performance Indicator |
|---|---|---|
| Produce fish to meet harvest needs | Hatchery production provides adult returns to terminal areas to meet Tribal treaty harvest rights and provide escapement to hatchery rack as defined in Management Plan | Treaty harvest in in-river fishery is on average between 10-15,000 adult chinook. |
| | Fishery management provides for harvest needs and meets escapement goals for natural and hatchery returns | A minimum of 1,700 adults return to hatchery rack annually for broodstock |
| | | Estimated escapement of natural spawners on average reaches goal of 1,100 adults |
| | Rearing practices maximize survival from egg to release | The rate of fertilization and survival from egg to smolt provides for production goal of 3.0 million 0-age smolts |
| Maintain genetic diversity of hatchery stock | Maintain large effective population size | Number of hatchery spawners maintained at a minimum of 1,700 |
| | Follow spawning protocol to increase effective population size | Implement modified 6*6 factorial spawning protocol |
| | Minimize changes in migratory behavior of hatchery stock | Broodstock collected through-out range of migration to the rack, from mid September to early November |

| | | |
|---|---|---|
| Control potential negative genetic impacts on natural spawners | Reduce potential straying of hatchery production by: utilizing only Nisqually hatchery returns; location of facility on a separate tributary in lower mainstem, with distinct water source. | Estimate the average stray rate of hatchery production to natural spawning areas over 2-3 brood year returns and evaluate impact of HOR strays. |
| Control potential negative ecological impacts on naturally produced juveniles | Minimize impacts of juvenile hatchery releases on naturally produced juveniles | Hatchery smolt size is maintained at minimum of 70 fish per pound to maximize probability of immediate outmigration |
| | | Hatchery smolts released below RM 6.3 to minimize interaction with natural outmigrating smolts |
| | | Eliminate the release of 200,000 fall chinook yearlings |

1.10) List of program "Performance Indicators", designated by "benefits" and "risks."

See table in section 1.9

## 1.11) Expected size of program.

**1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).** The average annual brood stock needs for this program will be 1700 adults. These fish will be derived from hatchery returns and will not require the mining of natural stocks. The average escapement to this facility from brood years 1995 through 1999 has been 4062 adults per year. During this period, escapements have ranged from a low of 1607 adults in 1995 to a maximum of 11,132 adults in 1999. Annual escapement to the facility has been as follows:

| Return Yr | # Males | # Females | Total Adults |
|---|---|---|---|
| 1992 | 7 | 5 | 12 |
| 1993 | 531 | 98 | 629 |
| 1994 | 224 | 177 | 401 |
| 1995 | 892 | 715 | 1607 |
| 1996 | 714 | 1112 | 1826 |
| 1997 | 1584 | 1269 | 2853 |
| 1998 | 1514 | 1380 | 2894 |
| 1999 | 5112 | 6020 | 11132 |

**1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.** (*Use standardized life stage definitions by species presented in* Attachment 2).

| Life Stage | Release Location | Annual Release Level |
|---|---|---|
| Eyed Eggs | | |

| Life Stage | Release Location | Annual Release Level |
|---|---|---|
| Unfed Fry | | |
| Fry | | |
| Fingerling | On-station, RM 6.3 Nisqually R. | 3.0 million |
| Yearling | | |

1.12) **Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.**

This program has been in operation since 1991, therefore results are only available for brood years 1990 through 1993 (brood year 1993 results should also be considered preliminary). Survival rates include total estimated recoveries in fisheries and escapement.

**Smolt-to Adult Survival Rates:**

| Brood Year | Est. Min. Total Survival Rate (%) | Est.Survival to Nisqually R.(%) |
|---|---|---|
| 1990 | 0.782 | 0.391 |
| 1991 | 0.135 | 0.090 |
| 1992 | 1.980 | 1.100 |
| 1993 | 0.342 | 0.203 |
| Mean BY 90-93 | 0.804 | 0.446 |

Program goals are to achieve total survival rates from 0.65% to 0.85% with .325% to .425% survival to the Nisqually River.

**Adult Production Levels:**

| Brood Year | Estimated Adult Production | Production Level (% of program) |
|---|---|---|
| 1990 | 7750 | 31.3% of program |
| 1991 | 1415 | 34.8% of program |
| 1992 | 10613 | 17.9% of program |
| 1993 | 2638 | 25.7% of program |

**Potential Adult Production Levels (Expanded to full production level of 3.0M fingerlings):**

The program goal for a release of 3.0M fingerlings is to achieve adult production levels to all fisheries and escapement of between 19,500 and 25,500 fish with 10,000 to 13,000 returning to the Nisqually River. The table below shows the estimated adult production levels that might have been achieved for brood year 1990 – 93 with the hatchery at full capacity. These figures are derived by expansion of the total survival rates and survival to the Nisqually River for brood years 1990 – 1993 with the program at full production.

| Brood Year | Expanded Adult Production Level | Expanded Nisqually R. Return |
|---|---|---|
| 1990 | 24,700 | 11,700 |
| 1991 | 4,100 | 2,700 |
| 1992 | 59,300 | 33,000 |
| 1993 | 10,200 | 6,100 |
| Mean BY 90-93 | 24,500 | 13,400 |

**Estimated Escapement Contribution:**

| Brood Year | Estimated Escapement Contribution |
|---|---|
| 1990 | 1785 |
| 1991 | 706 |
| 1992 | 2971 |
| 1993 | 921 |

Escapement needs for the program at full production of 3.0 million fingerlings will require an average of 1700 fish.

(All figures reported in Section 1.12 are derived from CRAS coded wire tag recovery reports for brood years 1990 – 1993.)

**1.13 Date program started (years in operation), or is expected to start.**

Program began with fish releases in 1991 (Brood year 1990).

**1.14) Expected duration of program.**

The primary goal of the program is to contribute to meeting the Nisqually Tribe's goal of providing an annual in-river harvest of 10,000 to 15,000 fall chinook. This artificial production program is expected to continue until this goal can be achieved by any other feasible means.

**1.15) Watersheds targeted by program.**

Nisqually River, WRIA 11, Puget Sound

**1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.**

With the potential for natural chinook production from the Nisqually River estimated at 1200 fish annually, and a maximum harvest of approximately 800 fish, the community needs of harvesting 10,000 – 15,000 chinook annually cannot be met without artificial enhancement. The Tribe has attempted to reach this goal by several different approaches, including no on-station artificial production, artificial production from the Kalama Creek hatchery and a facility operated by WDFW, and finally, operation of Kalama Creek along with the development of this program. Only since the addition of the Clear Creek program, beginning with returns in 1993, has this goal been approached and finally reached (Average annual catch of 7100 fish in 1993 – 99). The average tribal chinook harvest from 1940 to the present is shown below.

| Years | Annual Nisqually River Chinook Catch |
|---|---|
| 1940 – 49 | 1000 |
| 1950 – 59 | 600 |
| 1960 – 69 | 1500 |
| 1970 – 79 | 1000 |
| 1980 – 89 | 1500 |
| 1990 – 92 | 1600 |
| 1993 | 4163 |
| 1994 | 6123 |
| 1995 | 7171 |
| 1996 | 5365 |
| 1997 | 4309 |
| 1998 | 7990 |
| 1999 | 14614 |

## SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.

**1.1) List all ESA permits or authorizations in hand for the hatchery program.**
None

**2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.**

**1.1.1) Description of ESA-listed salmonid population(s) affected by the program.**

Much of this requested information is available for the composite Nisqually River chinook stock, but due to the current inability to distinguish hatchery origin fish from naturally produced fish, it is impossible to describe these population characteristics for the listed stock. Despite this limitation, information about the distribution of adult spawners is provided below.

<u>Distribution and Timing of Naturally Spawning Fall Chinook</u>
Fall chinook spawn throughout the mainstem from approximately RM 15 to approximately RM 40, as well as in the major tributaries of the Nisqually River including the Mashel River, and Ohop and Yelm Creeks. Total escapement estimates are generated by expansion of peak counts from index areas on the mainstem and the Mashel River. An accurate estimation of spawning distribution of fall chinook is nearly impossible in the mainstem due to extremely poor visibility from glacial runoff during the fall and early winter, however, the information that we have indicate that a major proportion of the spawning occurs in the mainstem, between RM 21.8 and RM 26.2.

Spawning occurs between mid-September and early November, with peak spawning generally occurring the first or second week of October.

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- **Identify the ESA-listed population(s) that will be <u>directly</u> affected by the program.**
  **No ESA-listed population is directly used in this program.**

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- **Identify the ESA-listed population(s) that may be <u>incidentally</u> affected by the program.**

Some natural origin Nisqually River fall chinook may voluntarily exit the Nisqually River into Clear Creek and be incorporated into the brood stock. This number is believed to be extremely low due to the location of the brood stock collection area, the water chemistry of the facility, and the flow of the hatchery creek in comparison to the mainstem Nisqually River. The adult collection facility is located approximately 0.2 miles upstream on Clear Creek, a tributary to the Nisqually River. The hatchery water source is spring fed in origin and flows through a large supply forebay on the hatchery site. It is believed to differ in water chemistry from the glacially influenced mainstem. The hatchery creek flow during adult chinook migration is also significantly lower than the flow in the mainstem, approximately 20 cubic feet per second compared to approximately 900 cubic feet per second. This difference as well would make it unlikely for a listed stock to be used in the program.

Listed fall chinook juveniles may also be incidentally affected through the release of juveniles for this program. Potential negative ecological and genetic impacts from juvenile releases will be minimized by providing temporal and spatial separation from program fish releases. Methods to minimize these interactions are described in other sections of this HGMP.

**2.2.2) Status of ESA-listed salmonid population(s) affected by the program.**

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- **Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds.**
  **The status of the composite Nisqually River fall chinook population would be considered to be above the viable population threshold. The average escapement estimate for this composite stock from 1988 – 1999 has been 1092 fish. The actual composition of the stock (natural vs. hatchery origin) is unknown. Escapement estimates for 1988 – 1994 were likely highly influenced by returning hatchery fish from the Schorno Springs facility spawning in the mainstem river. This facility, closed in 1992 in favor of on-station releases at Clear Creek, was a release site only, and returning adults would not have been segregated from natural origin chinook.**

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- **Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.**

**Due to the current inability to distinguish hatchery origin fish from naturally produced fish, this information is not available.**

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- **Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.**

**1988 – 1342**
**1989 – 2332**
**1990 – 994**
**1991 - 953**
**1992 - 106**
**1993 - 1655**
**1994 - 1730**
**1995 - 817**
**1996 - 606**
**1997 - 340**
**1998 - 834**
**1999 - 1399**

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- **Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions**

**of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.**
**As noted above, this information is presently unknown.**

**2.2.3) <u>Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take</u> *(see "Attachment 1" for definition of "take").***

**- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.**
**Other than the potential take described in Section 2.2.1., none of the categories in the take table apply to this program. Since there is, however, a chance that a naturally produced fall chinook could voluntarily swim into the adult collection facility, broodstock collection directed at hatchery fall chinook and coho has a "low" potential to take listed fall chinook salmon. If straying of natural fish into the facility does occur, it is doubtful that this number exceeds five to ten fish per year. This conclusion is based on average straying of naturally produced pink and normal timed chum salmon to the hatcheries. On a normal year, only 5 – 10 pink and normal timed chum are captured in the hatchery ponds. Since the average run size of these stocks is thought to be in the same order of magnitude as naturally produced chinook salmon, it is reasonable to expect a similar, although probably lower, stray rate from mainstem oriented chinook.**

**- Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.**
**None known.**

**- Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).**
**See "Take table" for worst case scenario for incidental take from listed stock voluntarily straying into hatchery creek and adult collection facility.**

**- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.**
**None**

## SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

**2.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the NPPC *Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.**
**An ESU-wide hatchery plan has not yet been developed. When available, this program will be reviewed for alignment with that plan.**

**3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.**

**This program operates under and is consistent with several court orders and agreements. These include U.S. v. Washington, and subsequent orders including the Puget Sound Salmon Management Plan, the Nisqually River Management Plan, and a memorandum of agreement on the operation of this facility between the Nisqually Indian Tribe and the US Fish and Wildlife Service.**

**3.3) Relationship to harvest objectives.**

**The Nisqually River fall chinook population has been managed as a composite stock (hatchery + natural), with the primary harvest objective of providing the required escapement for hatchery production as well as achieving a natural escapement of 900 fish. This was accomplished by managing for a combined escapement goal totaling the sum of the hatchery and natural escapement needs. Natural escapement estimates are provided in 2.2.2 above, and hatchery escapements for this facility are provided in 1.11.1 above. This management approach has resulted in a median total exploitation rate of 88.0% (Range 99.3% - 60.9%) and a median terminal exploitation rate of 71.3% (Range 97.3% - 38.3%) based on brood year 1979 – 1992 hatchery coded wire tags.**

**The artificial production programs in the Nisqually River have been integrated with a harvest management and habitat protection and restoration program that will minimize the biological risks to naturally produced fall chinook while maintaining the treaty protected rights of the Nisqually Tribe. To accomplish this, several actions, including the marking of all artificially produced fall chinook, moderation of harvest rates, and improved monitoring of natural escapement will be instituted. The management objectives will be to provide for treaty harvest, hatchery escapement, and for a minimum annual escapement of 500 natural origin recruits (NoR's). The total exploitation rates on NoR's is projected to be 73.2% (17% decrease from brood year 1979 – 92 base) with a terminal NoR exploitation rate of 40.2% (40% reduction from base years).**

**(Source: Draft Nisqually River Basin Fall Chinook Recovery Plan)**

**2.2.1) Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if**

available.

Fisheries benefiting from this program include Canadian fisheries (sport, net, and troll), Washington fisheries including pre-terminal treaty and non-treaty fisheries, and terminal treaty harvest primarily by the Nisqually Indian Tribe in the Nisqually River and McAllister Creek fishing areas. It is presumed that Washington freshwater sport fisheries in the Nisqually River also benefit from this program, but no coded wire tag recoveries are shown for that fishery. Estimated harvest levels by fishery are provided below. These fishery contribution rates are based on the actual hatchery release levels which had not reached full production levels for these brood years. The percentage of the full production represented for each brood year is shown in parentheses after the total fishery contribution. An estimate of future harvest rates on the listed stock is provided in 3.3 above.

| Fishery | BY 1990 | BY 1991 | BY 1992 | BY 1993 |
|---|---|---|---|---|
| Alaska | 3 | 0 | 0 | 0 |
| British Columbia | 1822 | 162 | 1084 | 137 |
| Oregon | 0 | 0 | 32 | 0 |
| Washington (General) | 2191 | 314 | 3580 | 741 |
| California | 0 | 0 | 0 | 0 |
| Treaty Terminal | 1927 | 234 | 2936 | 652 |
| Freshwater Sport | – | – | – | – |
| Total (% of Prog) | 5943 (31.3%) | 710 (34.8%) | 7632 (17.9%) | 1530 (25.7%) |

2.4) Relationship to habitat protection and recovery strategies.

A complete analysis of the natural production potential for the Nisqually River has been completed using the Ecosystem Diagnosis and Treatment methodology (EDT). This analysis indicates that the current natural production potential of Nisqually River fall chinook is approximately 1200 fish (after pre-terminal harvest) compared to an estimated 14,000 fish under historic conditions, or approximately 10% of its historic potential. The Nisqually estuary has suffered significant degradation with severe effects on natural production of fall chinook. Loss of performance is found primarily in the juvenile rearing life stage and is attributed to loss of habitat

**diversity and loss of quantity of key habitat. Mainstem reaches have generally not suffered to the extent of the estuary or tributaries, but have experienced loss of habitat quantity and diversity. The most severely impacted mainstem reaches are from Interstate 5 to the Burlington Northern bridge, the highway bridge at McKenna to the Centralia diversion dam, and the Centralia diversion dam to Tanwax Creek. Tributaries have generally suffered high losses in habitat quantity and have experienced a variety of habitat quality problems, including loss of habitat diversity, channel stability, less favorable flow regimes, and sediment problems.**

**Based on this analysis, the Nisqually Tribe has developed an extensive habitat protection and restoration framework and action plan focusing on factors that will provide the most benefit for the listed fall chinook stock as well as other anadromous species. Selective habitat restoration projects in the Nisqually River estuary, mainstem, and tributaries, along with protection of existing condition elsewhere are projected to provide an improvement of approximately 40% in the equilibrium run size entering the Nisqually**

**River. The complete habitat action work plan for the Nisqually basin can be found in the Draft Nisqually Basin Fall Chinook Recovery Plan.**

2.5) Ecological interactions.

**In order to keep the response to this question to a reasonable length, the discussion here will generally be limited to potential ecological interactions between the program fish and listed species. Some discussion of interactions between program fish and other salmonid species will be provided. The discussion will include identification of the potential risk, the likelihood of a negative impact occurring, and the actions taken in this program to reduce the risk.**

**Program Fall Chinook and Listed Nisqually River Fall Chinook**

**Predation – Program fall chinook may prey on listed Nisqually River fall chinook during several life stages in the freshwater, estuarine, and marine environment. In addition, the offspring of program chinook that may reproduce in the wild may also prey on the listed stock. The Species Interaction Workgroup (SIWG) formed under the Salmon and Steelhead Conservation and Enhancement Act of 1980 categorized this risk as unknown during freshwater and estuarine life histories. Predation is generally thought to be greatest when the prey is 1/3 or less the length of predator species. Puget Sound ocean type fall chinook are generally thought to migrate to saltwater at a size of 60 – 100 mm in length, making it unlikely that predation from program zero-age releases would adversely impact this life history strategy since the program fish are of similar size. Other actions can be taken to minimize the risk of predation including what type of fish are released and when, and how the fish are released. In the case of the program fish, all are volitionally released in the lower 6.3 miles of the Nisqually River as actively migrating smolts thus reducing duration**

**of overlaps in time and space. Note: This program discontinued the release of 200,000 fall chinook yearlings (6 fish per pound) primarily to reduce the risk of predation on naturally produced fall chinook and to minimize the potential domestication effects of this program on the hatchery brood stock.**

**Competition – Program fall chinook may compete with listed Nisqually River fall chinook for food and space in the freshwater, estuarine, and marine environment through both direct and indirect means. Returning adults from program production may also compete with naturally produced fall chinook for mates and spawning sites. The risk of competition in freshwater and early marine life is categorized as high by the SIWG. To reduce the risk of this interaction with the listed stock, the program will volitionally release smolts in the lower 6.3 river miles to minimize the duration of this interaction. The risk of competition by adults from this program will be minimized by discontinuing the use of non-local stocks for the hatchery program. The use of a locally adapting hatchery stock, along with maintaining a distinct and adequate hatchery attraction flow, will reduce to risk of straying and competition in the adult stage.**

**Disease Transmission – Hatchery effluent has the potential to transport pathogens from the hatchery water supply to receiving water containing listed and other stocks. Pathogens may also be transmitted by direct contact of infected hatchery fish with other stocks. Although these methods of disease transmission are possible, there is little information showing that pathogens are transferred to naturally produced stocks. This program is operated under the disease prevention and detection guidelines established in the "Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State. These practices should minimize this risk for both listed and other stocks.**

**Effects of Hatchery Effluent – Hatchery effluent may alter various properties of the receiving water used by listed and other stocks. These properties include suspended solids, settleable solids, temperature, dissolved oxygen, biological oxygen demand, and nutrient. This program is operated under discharge limitations set by the US Environmental Protection agency limiting the changes and effects of these properties on the receiving water. Adherence to these standards will minimize this risk for both listed and other stocks.**

**Program Fall Chinook and Other Nisqually River Salmonid Species**

**The risk of freshwater and early marine predation by program fish is categorized as unknown for interactions with steelhead and coho salmon, and low for pink and chum salmon (SIWG). Actions to minimize the risk of predation to these species are the same as described for interactions with the listed stock.**

**The risk of freshwater competition by program fish is categorized as high for interactions with steelhead and coho salmon, and low for pink and chum salmon (SIWG). Actions to minimize the risk of predation to these species are the same as described for interactions with the listed stock.**

## SECTION 4. WATER SOURCE

**3.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.**

**Clear Creek is a small independent tributary of the Nisqually River that originates from a series of springs on the Fort Lewis Military Reservation and enters the river at approximately RM 6.3. Access to approximately 0.5 miles of the stream is blocked to all adult fish by a sheet pile dam located approximately 0.2 miles upstream from the Nisqually River. Spring flow varies on an annual cycle from approximately 3000 gallons per minute (gpm) in the late fall and early winter to over 12,000 gpm in the spring. The facility is also able to draw ground water totaling up to 7000 gpm from five production wells on site. Detailed chemical analysis of the hatchery water supply in comparison to the Nisqually River has not been done. The hatchery water supply, however, flows through two supply forebays with a high hydraulic retention time, causing the hatchery discharge to have water chemistry characteristics more typical of a lentic environment than the glacially influenced Nisqually River.**

**The facility is operated under a National Pollution Discharge Elimination System (NPDES) permit issued by the US Environmental Protection Agency.**

**3.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.**

**As indicated in 4.1., the hatchery is located on an independent tributary of the Nisqually River. Use by fall chinook is thought to be limited to adults returning from the hatchery program. All intakes are screened and located above an impassable sheet pile dam that forms the lower supply forebay for hatchery rearing ponds. A low risk exists that a listed naturally produced chinook may voluntarily turn into Clear Creek, swim 0.2 miles to the hatchery pond, and be incorporated in the brood stock. This is minimized by the presumed chemical difference between the hatchery water supply and the glacial mainstem Nisqually. Clear Creek's flow during fall chinook returns of approximately 12 cubic feet per second (cfs) in comparison to mainstem flow of 750 – 900 cfs, also provides little attraction flow for naturally produced chinook.**

**Risk of take of listed fish from effluent discharge will be minimized by compliance with the discharge limitation set by the NPDES permit for this station.**

## SECTION 5. FACILITIES

***Provide descriptions of the hatchery facilities that are to be included in this plan (see "Guidelines for Providing Responses" Item E), including dimensions of trapping, holding incubation, and rearing facilities. Indicate the fish life stage held or reared in each. Also describe any instance where operation of the hatchery facilities, or new construction, results in destruction or adverse modification of critical habitat designated for listed salmonid species.***

**5.1) Broodstock collection facilities (or methods).**

**Brood stock is collected and held in a 50,000 cubic foot adult capture pond supplied with approximately 4000 gpm of water through three upwell supplies. The pond can be segregated into two large sections and a small center section by the use of wooden pickets. No brood stock is collected in the Nisqually River. All brood stock captured must voluntarily turn out of the mainstem Nisqually and traverse the creek and fish ladder to be captured.**

**5.2) Fish transportation equipment (description of pen, tank truck, or container used).**

**The facility uses transport equipment only when transferring fish from raceways into large rearing ponds for final rearing and release. This occurs early in the spring with fish weighing between 200 – 400 fish per pound. The transfer is an on-station transfer of a maximum of one-half mile. The transfer equipment consists of a 350 gallon insulated fiberglass transfer tank with oxygen supply. Loading for the on-station transfer is generally limited to 300 pounds of fish per load, with 3 liter per minute of oxygen supplied to the tank.**

**5.3) Broodstock holding and spawning facilities.**

**See 5.1 above for brood stock holding facility. Spawning takes place at the adult capture pond in a covered spawning area. All gametes are chilled after collection and transported one-half mile to the hatchery facility for fertilization.**

**5.4) Incubation facilities.**

**The incubation room contains 224 8-tray stacks of vertical incubators (1792 total trays) and 8 Sims trough incubators. Vertical incubators are supplied with 4 gpm of flow for each 8-tray stack. Sims trough incubators are used for eyeing only and are each supplied with 12 gpm of flow. Incubation water is supplied from four separate springs and/or two separate well supplies. An additional independent emergency incubation supply is operated by a float switch in the water distribution tower. This supply is activated in case of water loss to the distribution tower. Water supply to the distribution tower and the incubation room is protected with alarms linked to an alarm panel and autodialer system. A 350 kilowatt backup generator with automatic transfer equipment supplies emergency power to the site, and is also linked to the alarm notification system. The generator provides**

**emergency power to incubation and rearing water supply wells.**

**5.5) Rearing facilities.**
**Clear Creek is divided into two separate sites in order to maximize the available water supply. The upper site consists of a hatchery building, ten raceways, and one 50,000 cubic foot asphalt rearing pond. Water is supplied to the ponds from four spring sources and up to four production well supplies. The production wells at this site can provide up to 5500 gpm of ground water when necessary. Additional water can be supplied to the raceways and rearing pond from the forebay created by the upper Clear Creek sheet pile dam. The ponds at the upper site provide a total of 75,000 cubic feet of rearing space. Each of the ten raceways is 10 feet wide and 100 feet long with an average water depth of 2.5 feet, providing 2500 cubic feet of rearing space each. Each raceway is designed to used between 350 and 450 gpm of water. The large rearing pond at this site provides 50,000 cubic feet of rearing space and is designed to use 5000 gpm of water.**

**The lower site consists of four large rearing ponds located to take advantage of increased water flow from the lower forebay, an additional spring water supply, and an additional production well. All or part of the water supplied to the upper site can be reconditioned through the lower forebay and reused at this site as well. Two rearing ponds at this site provide 40,000 cubic feet of rearing space each, and use 3000 – 4000 gpm of water each. Another pond is a combination adult capture pond and juvenile rearing pond providing 50,000 cubic feet of rearing space. It is designed to use 4000 gpm of water. The fourth pond at this site provides 25,000 cubic feet of rearing space and uses 2200 – 2500 gpm of water provided directly from a spring intake or well supply.**

**5.6) Acclimation/release facilities.**
**No separate off-station acclimation/release sites currently exist.**

**5.7) Describe operational difficulties or disasters that led to significant fish mortality.**
**In nine years of operation, only one significant fish loss has occurred at this facility. In February 1996, a record flood inundated the lower hatchery site only two days after chinook fry were moved there for rearing. Of the 900,000 fish located there, an estimated 750,000 fry were swept out of the pond. Despite this loss, the program objectives were met during an event that caused extensive damage to other programs and facilities.**

**4.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality. This program does not directly take listed fish for brood stock, but risk aversion measures for the hatchery program are described**

below.

Many of the back-up systems have been described above. In addition to those, all rearing ponds have level alarms linked through an alarm panel to an autodialer system. The lower rearing site also has a back-up 60 kilowatt generator with automatic transfer equipment to provide power to that site in case of emergency. Although the hatchery is not staffed 24 hours a day, the combination of gravity flow available through the spring water supply, the alarm notification and the proximity of hatchery staff to the facility help prevent fish mortality.

Adult fish are screened for pathogens in accordance with the guidelines of the PHFHPC, and routine fish health monitoring exams are conducted on a monthly basis by staff from the Northwest Indian Fisheries Commission.

## SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

**Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.**

5.1) Source. Brood stock for the program have come from chinook from several different Puget Sound hatchery facilities (unlisted stocks). A list of stocks used by brood year is shown below.

| Brood Year | Stocks |
|---|---|
| 1990 | Kalama Creek |
| 1991 | Deschutes River, Finch Creek (Hood Canal) |
| 1992 | McAllister Cr., Green R., Clear Creek |
| 1993 | McAllister Cr., Clear Creek |
| 1994 | Kalama Cr., Clear Creek (Fingerling Program) McAllister Cr. (Yearling Program) |
| 1995 | Clear Cr., Kalama Cr. (Fingerling Program) McAllister Cr. (Yearling Program) |
| 1996 | Clear Cr., Kalama Cr. (Fingerling Program) McAllister Cr. (Yearling Program) |
| 1997 | Clear Cr. (Fingerling Program), Yearling Program discontinued |
| 1998 | Clear Creek |
| 1999 | Clear Creek |

6.2) Supporting information.

5.1.1) History.

As stated in 6.1., the program stock was founded from several different Puget Sound hatchery stocks. The last stock importation for the fingerling program was brood year 1993 McAllister Creek stock, an adjacent watershed. The last stock

**importation for the discontinued yearling program was brood year 1996 McAllister Creek stock. No purposeful selection has been applied to change the characteristics of the founding brood stocks.**

5.1.2) **Annual size.**

**There is currently no way to determine the extent of incorporation of natural fish into the hatchery brood stock. No natural spawning fish are deliberately captured for this purpose.**

5.1.3) **Past and proposed level of natural fish in broodstock.**

**See 6.2.2. above. No information is available regarding the annual number of natural fish incorporated in the brood stock.**

5.1.4) **Genetic or ecological differences.**

**This information is not currently known. Given the duration and number of hatchery fish outplanted and released into the Nisqually River, combined with historic harvest rates directed at these fish, it is assumed that the hatchery and natural stocks are extremely similar or the same.**

6.2.5) Reasons for choosing.

**Choice of brood stock was based on stocks having the highest likelihood of similarities in genetic lineage, life history, and watershed environment, as well being able to provide the number of eggs needed for production and a high likelihood of success in providing fishery benefits.**

**Background: The management intent for Nisqually River chinook salmon has generally been to provide maximum harvest opportunities and to provide for levels of escapement only appropriate for hatchery stocks. This designation meant that no directed management actions would be taken specifically for natural stock needs. Harvest rates were determined primarily by hatchery escapement needs, therefore stocks were routinely subjected to harvest rates in excess of 90%. This stock status was consistent throughout southern Puget Sound for summer/fall chinook. In addition to harvest rates inappropriate for natural stocks, the Nisqually River has received substantial releases of hatchery chinook of various stocks since at least 1943. Between 1943 and 1974, over 12.8 million chinook were released throughout the watershed. The average yearly release was over 400,000 fish. The stock origin of the releases during this time period is unknown with the exception of releases in 1974 from Issaquah hatchery.**

**From 1975 through 1990, hatchery outplanting and releases into the Nisqually River totaled over 39.3 million fish with average yearly releases of over 2.46 million fish. Over 71% of these releases were as outplants or from a facility where hatchery returns could not segregate from natural spawners. The stock origin of these**

**releases included at least nine different Puget Sound and Hood Canal hatchery stocks. Given the presumed lack of a distinct Nisqually River fall chinook stock, brood stock choice was based on which stocks were believed to be most likely to assure success in providing fishery benefits and building a viable locally adapted brood stock.**

**6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.**
**Brood stock for this program will be from returns to Nisqually River facilities only. Stock imports from outside the basin have been discontinued. This should allow for the continuing local adaptation of the hatchery stock, and should reduce the risk of straying into the natural spawning population. Discontinuing the yearling program should reduce the risk of introducing domestication effects on the hatchery and natural stock should straying occur at a substantial rate.**

## SECTION 7. BROODSTOCK COLLECTION

**7.1) Life-history stage to be collected (adults, eggs, or juveniles).**
**All adults and precocious males returning to the brood stock pond.**

**7.2) Collection or sampling design.**
**Returning fish are captured at the hatchery pond located approximately 0.2 miles from the mainstem Nisqually. The pond is operated between August and December and all returning adults are captured. The hatchery pond captures approximately 99% of the adult return to the hatchery creek. The remaining 1% spawn in the creek below the hatchery outfall. A potential bias exists based on the willingness of different ages and sizes of fish to voluntarily leave the mainstem for the hatchery creek.**

**7.3) Identity.**
**There is currently no method available to identify the hatchery population from listed fish. Initial efforts to increase the number of marks on hatchery production began with brood year 1998, with approximately 50% of the release marked, tagged, or both. The intent is to have an identifiable mark on all hatchery chinook releases beginning with brood year 1999. This plan will be difficult to accomplish, however, because of the inability to absolutely segregate fish for marking in the large rearing ponds and the potential for fin regeneration. A sample of the 1999 brood year chinook from this program found a bad clip rate (adipose fins thought to regenerate) of approximately 15% and approximately 6% of the release without the appropriate mark. Given these figures, the size of the brood stock population handled, and the presumed low contribution of listed fish to the hatchery stock, a positive identification of individual listed fish is unlikely.**

**7.4) Proposed number to be collected:**

**7.4.1) Program goal (assuming 1:1 sex ratio for adults):**
**Program needs are approximately 1700 fish. Recent escapement levels in 1997 - 1999 (reported in 1.11 above) have exceeded that level by 67% to 550%.**

**7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:**

| Year | Adults<br>Females | Males | Jacks | Eggs | Juveniles |
|---|---|---|---|---|---|
| 1988 | | | | | |
| 1989 | | | | | |
| 1990 | | | | | |
| 1991 | 5 | 9 | 22 | | |
| 1992 | 5 | 7 | 283 | | |
| 1993 | 98 | 531 | 504 | | |
| 1994 | 177 | 224 | 526 | | |
| 1995 | 715 | 892 | 1450 | | |
| 1996 | 1112 | 714 | 2223 | | |
| 1997 | 1269 | 1584 | 22427 | | |
| 1998 | 1380 | 1514 | 7013 | | |
| 1999 | 6020 | 5112 | 1637 | | |

**Data source: (Link to appended Excel spreadsheet using this structure. Include hyperlink to main database)**

**7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.**
**As stated previously, brood stock is collected from voluntary returns to the hatchery rack. No listed stocks are purposely collected for this program. Hatchery returns can exceed program needs, especially with harvest rates reduced to levels more**

**appropriate for sustainability of natural stocks. When culling is necessary, adults are selected for spawning at random in proportion to return timing.**

**7.6) Fish transportation and holding methods.**

**No transportation of adults is required. Adult returns are held in a 50,000 cubic foot pond with approximately 4000 gpm of water supplied through an upwelling supply system. Adults are typically held for a short period, one to four weeks, and pre-spawning mortality is typically 5% or less. No prophylactic treatment of adults is necessary.**

**7.7) Describe fish health maintenance and sanitation procedures applied.**

**All returning adults are sampled in accordance with the "Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State." All eggs taken are disinfected in accordance with the policy prior to entering the main hatchery building. Eggs are also disinfected after sorting and prior to being put down to hatch.**

**7.8) Disposition of carcasses.**

**After gamete collection, hatchery carcasses are distributed to tribal members and the general public. Carcasses are also distributed in the upper Nisqually watershed for nutrient enrichment.**

**6.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.**

**No listed fish are deliberately collected for this program. Maintaining the adult collection facility on a tributary with a distinct water supply (in comparison to the Nisqually River mainstem) will minimize the risk of adverse genetic or ecological effect to listed fish resulting from brood stock collection.**

## SECTION 8. MATING

**Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.**

**8.1) Selection method.**

**Sorting and spawning takes place from 1 to 3 times per week depending on the number of fish returning. All ripe females encountered each day are selected for spawning unless there are obvious indications of non-viable eggs or the presence of pathogens such as bacterial kidney disease. Fish are spawned throughout the entire run unless excess fish are available. In this case, incubation space or the ability to handle small lot sizes may be limiting, and some of the latest maturing females may not be spawned, but egg collection takes place over a minimum of 90% of the run. When the number of returning adults far exceeds the program capacity of the facility, spawners are chosen randomly over the run.**

**8.2) Males.**

**Males are selected randomly on each spawning day. The number of males spawned is the total return (if less than the number of females), or a number equal to the number of females spawned. No special effort is taken to select a specific proportion of precocious males. Instead, a minimum size is chosen for selecting males for spawning. This size includes some jacks (generally 2% - 5% of the total number of males) based on length frequencies of coded wire tag returns. No backup males have been used, and the number of males returning to the hatchery has been large enough to prevent the need for reusing spawners.**

**8.3) Fertilization.**

**The majority of gametes (approximately 2/3 of the egg take) are fertilized using equal sex ratios and pooled gametes, approximately six individuals per container. One third of the gametes are fertilized using a modified 6 X 6 factorial mating scheme to increase the effective population size of the hatchery stock. Using this protocol, the effective population size of the composite hatchery stock will be maintained at between 1500 and 2500 fish.**

**All eggs are handled in accordance with the "Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State."**

**8.4) Cryopreserved gametes.**

**None used.**

**8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.**

**The mating strategy described will minimize the likelihood of significant loss of genetic diversity in the hatchery stock. Collection of spawners throughout the run minimizes inadvertent selection for a particular portion of the run. Random mating minimizes artificial selection of the brood stock.**

## SECTION 9. INCUBATION AND REARING -

**Specify any management *goals* (e.g. "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.**

**The station goal is to attain a survival of 90% from green egg to the eyed stage and a survival of 95% from the eyed stage to ponding.**

**9.1) Incubation:**

**8.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.**

**The average survival of fall chinook eggs from the green to eyed stage for brood years 1992 – 1999 has been 90.4%. The average survival from the eyed stage to**

**ponding for the same brood years has been 98.3%. A summary of annual survival rates during incubation is provided below.**

| Brood Year | Egg Take | Green-Eyed Survival (%) | Eyed-Ponding Survival (%) |
|---|---|---|---|
| 1992 | 21,200 | 90.2 | 97.8 |
| 1993 | 314,800 | 92.1 | 95.9 |
| 1994 | 515,000 | 94.7 | 98.9 |
| 1995 | 2,036,000 | 93.2 | 98.3 |
| 1996 | 3,049,000 | 91.6 | 97.8 |
| 1997 | 4,434,000 | 91.8 | 99.2 |
| 1998 | 3,928,000 | 85.6 | 99.2 |
| 1999 | 4,275,000 | 84.2 | 99.0 |

**9.1.2) Cause for, and disposition of surplus egg takes.**
**Eggs in excess of program needs are taken when available to safeguard against potential incubation losses. Culling of excess eggs, if necessary, is done randomly over the entire egg take to maintain run timing and maximize the potential number of family crosses.**

**9.1.3) Loading densities applied during incubation.**
**Eggs are incubated to the eyed stage in Sims troughs. Standard loading is approximately 70,000 eggs per cell or 700,000 eggs/trough. Approximately 12 gpm of water is supplied to each trough. After removal of nonviable eggs at the eyed stage, eggs are inventoried into 8-tray vertical incubators supplied with 4 gpm of water each. Each tray is loaded with approximately 5600 eggs and contains artificial vexar substrate.**

**9.1.4) Incubation conditions.**
**Water supply to the incubators in monitored four to five times per day. Influent dissolved oxygen levels are at saturation, and effluent dissolved oxygen levels are within acceptable parameters. Incubation water is generally supplied from four separate springs, but may also be supplemented with well water supply. The spring water supplies average 51 degrees Fahrenheit and only varies by 1 - 2 degrees year round. Well water supplies average 50 degrees Fahrenheit and vary by 1 degree year round.**

**9.1.5) Ponding.**
**Fall chinook are ponded into raceways directly from vertical incubators. Ponding is forced and takes place at between 1550 and 1650 accumulated temperature units. Because of the relatively warm incubation water, ponding typically begins in mid-December and continues as subsequent egg takes reach the proper stage of**

**development.**

**9.1.6) Fish health maintenance and monitoring.**
**Eggs are treated daily with a fifteen minute formalin drip while in the Sims troughs. Nonviable eggs are removed by machine and hand picking once they have reached the eyed stage. Formalin treatment and removal of mortalities is discontinued once the eggs are transferred to vertical incubators, approximately ten to fourteen days prior to hatching.**

**9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.**
**Eggs are incubated on multiple gravity spring water supplies to minimize the risk of catastrophic loss due to flow interruption. One well water supply is also typically used to minimize the risk of loss due to siltation should a slide occur at a spring intake.**

**9.2) Rearing:**

**9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available..**
**Survival rates from ponding to release as fingerlings for brood years 1990 – 1998 have averaged 95.0%. Survival rates by brood year are presented below.**

| Brood Year | Ponding to Release Survival (%) |
|---|---|
| 1990 | 99.5 |
| 1991 | 96.7 |
| 1992 | 91.3 |
| 1993 | 99.0 |
| 1994 | 94.2 |
| 1995 | 77.9* |
| 1996 | 99.0 |
| 1997 | 99.2 |
| 1998 | 98.6 |

*** Record flood on Nisqually River inundated lower hatchery site causing loss of approximately 750,000 fry.**

**8.1.2) Density and loading criteria (goals and actual levels).**
**Facilities and ponding procedures have been described in sections 5.5 and 9.1 above. Raceways are used for initial feeding after transfer of fry from the incubation room. Fish are reared from two to four weeks in the raceways, then transferred to the large rearing ponds at the lower site for final rearing and release. Maximum density and loading indices in the raceways range from 0.13 – 0.17 lbs. of fish/cubic**

**foot/inch of fish and**
**1.01 – 1.3 lbs. of fish/gpm/inch of fish at transfer.**

**Maximum density and loading indices in the large rearing ponds range from 0.11 – 0.14 lbs. of fish/cubic foot/inch of fish and 1.3 – 1.5 lbs. of fish/gpm/inch of fish at release.**

**1.1.1) Fish rearing conditions**
**Rearing conditions at this facility vary by water source and site. The upper site that is supplied directly with spring and well water averages 51 degrees F and only varies by 1 degree year round. The lower site, which is supplied with water from a large forebay supply, shows considerably more temperature variation depending on air temperature and flow. The temperature at this site averages 51 degrees F, but has ranged from 37 – 57 degrees. Influent dissolved levels (D.O.) are at saturation and range from 10.8 – 11.3 parts per million (ppm). Effluent D.O. levels from the large rearing ponds at maximum loading range from 8.7 – 9.2 ppm. Effluent D.O. levels from all rearing vessels remain above 80% of the saturation level. Effluent temperatures and dissolved oxygen levels are within the limits required by the station's NPDES permit.**

**Ponds are cleaned regularly using a vacuum system that pumps the waste to pollution abatement ponds at each site. The frequency of cleaning is dependent on fish size, pond loading, and feeding levels, but generally is once per week in the raceways and twice per month in the large rearing ponds.**

**9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.**
**Because of the relatively warm spring and well water supply, fall chinook can grow rapidly at this station and are released as 0+ age smolts from the end of April through the middle of June. Growth during the entire rearing period averages 2.2% per day, but varies significantly through the rearing period. Initial growth after ponding is very rapid, but decreases through late March or early April. The growth rate then increases until smoltification from May to June. Estimates of growth rates through the rearing period are provided below.**

| Time Period | Estimated Growth Rate % BW/day |
|---|---|
| 12/25 – 1/15 | 3.1 – 3.5 |
| 1/15 – 2/15 | 3.1 – 3.6 |
| 2/15 – 3/1 | 2.7 – 3.2 |
| 3/1 – 4/1 | 1.7 – 2.0 |

| | |
|---|---|
| **4/1 – Release** | **1.9 – 2.3** |

**9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.**
**NA**

**8.1.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).**

**Fish are reared on a commercial feed formulation produced by Bio-Oregon. Initial feeding (10 – 14 days) is done with Bio-starter and food is presented based on the willingness of the fish to accept it. Once fish are actively feeding, the formulation is changed to Bio-dry 1000. Food size, frequency, and rate follow the manufacturer's recommendations for fish size and water temperature. Maximum feed rates in pounds of food fed per gallon per minute of inflow are generally 0.06 – 0.07. Feed conversion during the entire rearing period averages 0.8 – 0.9 lbs. of feed fed/lb. of growth.**

**8.1.7 Fish health monitoring, disease treatment, and sanitation procedures.**
**The program goal is to maintain fish health through proper rearing densities and hygiene. This approach has resulted in no disease epizootics requiring treatment since 1992. Additionally, fish health is monitored on a monthly basis by pathologists from the tribal fish health center. Disease treatments, if necessary, are conducted under the direction of these specialists based on their findings.**

**9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.**
**NA.**

**9.2.9) Indicate the use of "natural" rearing methods as applied in the program.**
**Natural rearing techniques are currently being evaluated in a research project described in Section 12 below.**

**8.1.10) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.**
**Fish are reared to 0+ age smolt size to mimic the natural fish emigration strategy and minimize the potential for domestication effects.**

## SECTION 10. RELEASE

**Describe fish release levels, and release practices applied through the hatchery program.**

***Specify any management goals (e.g. number, size or age at release, population uniformity, residualization controls) that the hatchery is operating under for the hatchery stock in the appropriate sections below.***

**10.1) Proposed fish release levels.** ***(Use standardized life stage definitions by species presented in Attachment 2. "Location" is watershed planted (e.g. "Elwha River").)***

| Age Class | Maximum Number | Size (fpp) | Release Date | Location |
|---|---|---|---|---|
| Eggs | | | | |
| Unfed Fry | | | | |
| Fry | | | | |
| Fingerling | 3.0 Million | 40 – 50 | 4/30 – 6/15 | Nisqually River |
| Yearling | | | | |

**10.2) Specific location(s) of proposed release(s).**
**Stream, river, or watercourse: Clear Creek (11.0013C)**
**Release point: Clear Creek RM 0.2 (Nisqually RM 6.3)**
**Major watershed: Nisqually River**
**Basin or Region: Puget Sound**

**10.3) Actual numbers and sizes of fish released by age class through the program.**
***For existing programs, provide fish release number and size data for the past three fish generations, or approximately the past 12 years, if available. Use standardized life stage definitions by species presented in Attachment 2. Cite the data source for this information.***

| Release year | Eggs/ Unfed Fry | Avg size | Fry | Avg size | Fingerling | Avg size | Yearling | Avg size |
|---|---|---|---|---|---|---|---|---|
| 1988 | | | | | | | | |
| 1989 | | | | | | | | |
| 1990 | | | | | | | | |
| 1991 | | | | | 940,000 | 65.0 | | |
| 1992 | | | | | 1,094,000 | 48.0 | | |
| 1993 | | | | | 536,000 | 54.9 | | |
| 1994 | | | | | 985,000 | 51.4 | | |
| 1995 | | | | | 2,043,500 | 54.8 | | |

| Release year | Eggs/ Unfed Fry | Avg size | Fry | Avg size | Fingerling | Avg size | Yearling | Avg size |
|---|---|---|---|---|---|---|---|---|
| 1996 | | | | | 2,078,000 | 49.9 | 178,900 | 8.5 |
| 1997 | | | | | 2,945,000 | 40.8 | 191,600 | 6.2 |
| 1998 | | | | | 2,704,000 | 44.2 | 174,000 | 8.2 |
| 1999 | | | | | 3,135,000 | 50.9 | | |
| Average | | | | | 1,828,944 | 51.1 | | |

**Data source: (Link to appended Excel spreadsheet using this structure. Include hyperlink to main database)**

**10.4) Actual dates of release and description of release protocols.**
**Fish are released from the end of April through mid-June. The release is volitional until the pond population is reduced to a level that feeding is impossible. Those fish, generally a few thousand per pond, are ultimately forced out. The most recent five year release dates are provided below.**

| Release Year | Fingerling Release Dates | Yearling Release Dates |
|---|---|---|
| 1995 | 4/25 – 5/18 | |
| 1996 | 5/6 – 5/17 | 4/24 – 4/26 |
| 1997 | 5/6 – 5/19 | 4/7 – 4/16 |
| 1998 | 5/11 – 6/5 | 4/1 – 4/21 |
| 1999 | 5/7 – 6/4 | |

**10.5) Fish transportation procedures, if applicable.**
**NA**

**9.6) Acclimation procedures (*methods applied and length of time*).**
**NA**

**10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.**

**The proportion of fish marked has varied from approximately 7% to nearly 50% in the last five years. Fish were primarily marked and tagged to provide estimates of contribution and survival rates. Beginning with brood year 1998, the number of marked fish has been increased in order to identify hatchery adults. An effort was made to mass mark all hatchery releases for brood year 1999, and this effort is expected to continue. The proportion of hatchery releases marked and or tagged during the five previous release years is provided below.**

| Release Year | % of Fingerlings Marked/Tagged | % of Yearlings Marked/Tagged |
|---|---|---|
| 1995 | 0 | |
| 1996 | 10.4 | 0 |
| 1997 | 7.7 | 23.5 |
| 1998 | 7.7 | 96.5 |
| 1999 | 48.3 | |

**10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.**
**Proper inventory techniques particularly at the egg stage should prevent surplus occurring. Should this not be adequate, surplus fish would be killed or released in approved landlocked areas.**

**10.9) Fish health certification procedures applied pre-release.**
**Juvenile fish are examined monthly up to the time of release.**

**10.10) Emergency release procedures in response to flooding or water system failure.**
**Flooding levels are not predictable enough on the Nisqually River to foresee the need to release fish. In addition, at this facility, purposely releasing fish into a flooding river is probably not as effective as attempting to maintain the integrity of the ponds and water supply system, and allowing flood water to submerge the rearing ponds. Because of the multiple water supplies (five springs, three forebay intakes, and five production wells) at this facility, the risk of a water system failure is unlikely. In that event, however, only the minimum number of fish necessary would be released in order to protect the health of the remaining population.**

**10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.**
**Fall chinook are volitionally released from late April through mid-June in the lower mainstem of the river to minimize the likelihood for interaction and adverse ecological effects to listed chinook juveniles.**

## SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

### 10.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

#### 11.1.1) Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.

| Performance Indicator | Monitoring and evaluation |
|---|---|
| Treaty harvest in in-river fishery is on average between 10-15,000 adult chinook. | Fish Tickets |
| A minimum of 1,700 adults return to hatchery rack annually for brood stock | Count rack return. |
| Estimated escapement of natural spawners on average reaches goal of 1,100 adults | Estimation of natural spawners described in Nisqually Basin Fall Chinook Recovery Plan |
| The rate of fertilization and survival from egg to smolt provides for production goal of 3.0 million 0-age smolts | Hatchery records |
| Number of hatchery spawners maintained at a minimum of 1,700 | Count spawners in hatchery. |
| Implement modified 6*6 factorial spawning protocol | See section 8.3 |
| Brood stock collected through-out range of migration to the rack, from mid September to early November | Hatchery records |
| Estimate the average stray rate of hatchery production to natural spawning areas over 2-3 brood year returns and evaluate impact of HOR strays. | Estimation of stray rate of HOR adults described in Nisqually Basin Fall Chinook Recovery Plan |
| Hatchery smolt size is maintained at minimum of 70 per pound to maximize probability of immediate outmigration | Hatchery records |
| Hatchery smolts released below RM 6.3 to minimize interaction with natural outmigrating smolts | Hatchery records |

#### 11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

**Funding for monitoring and evaluation are expected to be available.**

### 10.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

**Monitoring and evaluation activities will require the capture of adult returns above the tribal fishery to conduct the change in ratio escapement estimate described in the draft Nisqually Basin Fall Chinook Recovery Plan. This fishery will be**

**conducted to minimize negative effects on listed fall chinook. Measures will include using an actively fished gill net or tangle net for capture with adults removed immediately. This fishery will be conducted under the direct supervision of a qualified tribal biologist.**

## SECTION 12. RESEARCH

***Provide the following information for any research programs conducted in direct association with the hatchery program described in this HGMP. Provide sufficient detail to allow for the independent assessment of the effects of the research program on listed fish.***

**12.1) Objective or purpose.**
**The goal of the research is to compare survival between fall chinook reared conventionally in a large asphalt pond and those reared with the addition of bottom and surface structures. Based on research showing that the post-release survival of juvenile salmon can be improved, the hypothesis is that the addition of structures to the rearing pond will increase the smolt to adult survival of chinook salmon.**

**12.2) Cooperating and funding agencies.**
**Nisqually Indian Tribe and the Washington Department of Fish & Wildlife are cooperating on this project. The funding source is the Hatchery Scientific Review Group.**

**12.3) Principle investigator or project supervisor and staff.**
**Geraldine Vander Haegen, Principal Investigator. Bill St. Jean, Project Supervisor**

**12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.**
**NA**

**12.5) Techniques: include capture methods, drugs, samples collected, tags applied.**
**Rearing techniques described in this HGMP, with the exception of the addition of the surface and bottom structures. Study group tagged differentially from US/Canada stock tagging at this facility.**

**12.6) Dates or time period in which research activity occurs.**
**Fish rearing activity occurs January through May of 2001 – 2003. Adult tag recovery begins July 2002 for BY 2000 jacks and continues for three brood years.**

**12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.**
**Same as described in this HGMP.**

**12.8) Expected type and effects of take and potential for injury or mortality.**
**NA**

**12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take table" (Table ).**
**NA**

**12.10) Alternative methods to achieve project objectives.**
**Conduct research at a different facility.**

**12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.**
**NA**

**11.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.**
**Same as described in this HGMP.**

## SECTION 13. ATTACHMENTS AND CITATIONS

***Include all references cited in the HGMP. In particular, indicate hatchery databases used to provide data for each section. Include electronic links to the hatchery databases used (if feasible), or to the staff person responsible for maintaining the hatchery database referenced (indicate email address). Attach or cite (where commonly available) relevant reports that describe the hatchery operation and impacts on the listed species or its critical habitat. Include any EISs, EAs, Biological Assessments, benefit/risk assessments, or other analysis or plans that provide pertinent background information to facilitate evaluation of the HGMP.***


**1. CRAS Coded Wire Tag Retrieval and Analysis System**
**Nisqually Fall Chinook CWT Summary Reports Brood Years 90 – 93**
**Nisqually Fall Chinook CWT Recovery Distribution Reports Brood Years 90 – 93**
**Nisqually Fall Chinook Freshwater Recovery Reports Brood Years 90 - 93**
**2. Draft Nisqually Basin Fall Chinook Recovery Plan, September 1999**
**3. Northwest Indian Fisheries Commission Release Records**
**4. Hatchery Reform Research Proposal**


## SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

**"I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."**

**Name, Title, and Signature of Applicant:**

**Certified by_____________________________ Date:_____________**

**Table 1. Estimated listed salmonid take levels of by hatchery activity.**

| Listed species affected: Fall Chinook__________________ ESU/Population:_Puget Sound/Nisqually River_______ Activity: | | | |
|---|---|---|---|
| Location of hatchery activity: Nisqually River__________ Dates of activity:____________________ Hatchery program opera | | | |
| | Annual Take of Listed Fish By Life Stage *(Number* | | |
| Type of Take | Egg/Fry | Juvenile/Smolt | Adult |
| Observe or harass a) | | | |
| Collect for transport b) | | | |
| Capture, handle, and release c) | | | |
| Capture, handle, tag/mark/tissue sample, and release d) | | | Unknown |
| Removal (e.g. broodstock) e) | | | |
| Intentional lethal take f) | | | |
| Unintentional lethal take g) | Unknown | Unknown | 7 |
| Other Take (specify) h) | | | |

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstre
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downs through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release i integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

***Instructions:***

1. ***An entry for a fish to be taken should be in the take category that describes the greatest impact.***
2. ***Each take to be entered in the table should be in one take category only (there should not be more than one entry for the same sa***
3. ***If an individual fish is to be taken more than once on separate occasions, each take must be entered in the take table.***